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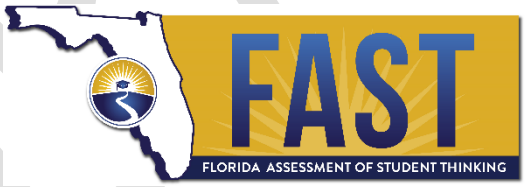
Grade 6 Mathematics Test Item Specifications



INTENDED FOR TEST ITEM WRITERS AND REVIEWERS FOR FLORIDA'S STATEWIDE ASSESSMENTS. NOT FOR INSTRUCTIONAL USE.

The contents of these draft *Test Item Specifications (Specifications)* are based on the benchmarks provided in Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards. The *Specifications* define the content and format of the tests and test items and indicate the alignment of items with the benchmarks for test item writers and reviewers. **The *Specifications* are not intended for instructional use.**

With the adoption of Florida's B.E.S.T. Standards for ELA and Mathematics, the following comprehensive resource has been developed to support educators.

- Within the standards, **benchmark clarifications** provide helpful information for educators to understand and to implement each standard.

Given the availability of B.E.S.T. resources, and to prevent any misuse of the *Specifications* by educators, item specifications for ELA and Mathematics assessments aligned to the B.E.S.T. Standards will be reserved for their intended purpose of guiding item writers and reviewers. B.E.S.T. Standards implementation should be driven by the instructional support provided by the Just Read, Florida! Office (JRF) and the Bureau of Standards and Instructional Support (BSIS) to ensure that the focus remains on the content and skills students will engage with in the classroom.

Origin of the Specifications
The Florida Department of Education convened committees of Florida educators to help develop and approve the specifications documents.

Technology-Enhanced Item Descriptions

The Florida B.E.S.T. Standards Assessments are composed of test items that include traditional multiple-choice items as well as enhanced items that require students to select and/or support their answers.

The various enhanced item types are described below.

- **Technology-Enhanced Item Types—Mathematics**
  - **Editing Task Choice**—The student clicks a drop-down menu containing options to complete an equation or expression, a statement, or other component. The student then selects the correct response from the drop-down menu. For paper-based assessments, this item type is modified; the student fills in a bubble to indicate a selection.
  - **Selectable Hot Text**—The student is directed to click on one or more correct answers from among a number of options. When the student hovers over the options (e.g., phrases, sentences, numbers, or expressions), the text will highlight. This indicates that the text is selectable ("hot"). The options may be presented in various ways (e.g., as a list, embedded within text, or in a table). The student can then click on an option to select it. For paper-based assessments, this item type is modified; the student fills in a bubble to indicate a selection.
  - **Multiselect**—The student is directed to select all the correct answers from among a number of options. These items are different from Multiple Choice items, which allow the student to select only one correct answer. These items appear in the online and paper-based assessments.
  - **Graphic Response Item Display (GRID)**—The student uses the point, line, or arrow tools to create a response on a graph. The item type may also require the student to select numbers, words, phrases, or images and use the drag-and-drop feature to place them into a graphic. For paper-based assessments, this item type will be replaced with another item type.
  - **Equation Editor**—The student enters a number, variable, expression, or equation, as appropriate to the test item, in a response box. The student is presented with a toolbar that includes a variety of mathematical symbols that can be used to create a response. The response box may be separate from the text of the item, or it may be embedded within text of the item (e.g., in line with a sentence or within a table). For paper-based assessments, this item type is modified; the student writes a response in the response box.
  - **Matching Item**—The student checks a box to indicate whether information from a column header matches information from a row. The number of correct answer options per row or column may vary. These items appear in the online and paper-based assessments.

Any of the item types may be combined into a single item with multiple parts called a multi-interaction item. The student will interact with different item types within a single item. Each part could be a different item type. For paper-based assessments, different item types (multiple choice, multiselect, editing task choice, selectable hot text, matching, and equation editor) may be combined into a single item.

Item Specifications Definitions

- **Assessment Limits** define the range of content knowledge and degree of difficulty that should be assessed in the assessment items for the benchmark(s).
- **Meaning of Also Assesses**—Where mastery of overlapping mathematical skills of associated benchmark(s) could be assessed through primary benchmark(s).
- **Calculator Availability**
  The following chart displays the type of calculator that is available for each grade or course B.E.S.T. Assessment. Note: For grades 6, 7, 8, Algebra 1, and Geometry, calculators are available for the entire assessment.

Grade/Course	Calculator
3, 4, 5	None
6	Basic four-function
7, 8	Desmos scientific
Algebra 1, Geometry	Desmos scientific

  - **Calculator Designations**
    - **None**—Items for this benchmark **may not** allow for the availability of a calculator.
    - **Available**—Items for this benchmark **must** allow for the availability of a calculator.

- **Context Designations**
  Any item could include justifying and error analysis through reasoning.
  - **Real-world**—authentic application of mathematics to real-world situations
  - **Mathematical**—using models, equations, or evaluation of mathematical reasoning in the absence of a real-world context
  - **Both**—items could either use a real-world context or be strictly mathematical

Number Sense and Operations

MA.6.NSO.1	***Extend knowledge of numbers to negative numbers and develop an understanding of absolute value.***
MA.6.NSO.1.1	Extend previous understanding of numbers to define rational numbers. Plot, order and compare rational numbers.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, the expectation is to plot, order and compare positive and negative rational numbers when given in the same form and to plot, order and compare positive rational numbers when given in different forms (fraction, decimal, percentage). *Clarification 2:* Within this benchmark, the expectation is to use symbols (<, > or =).
Context	Mathematical
Calculator	Available
Assessment Limits	Items requiring the student to plot, order, and/or compare numbers in the same form must contain at least one negative value. Items requiring the student to plot, order, and/or compare numbers in different forms are limited to fractions that result in a terminating decimal. Items may use the words "is less than," "is greater than," or "is equal to."

MA.6.NSO.1	***Extend knowledge of numbers to negative numbers and develop an understanding of absolute value.***
MA.6.NSO.1.2	Given a mathematical or real-world context, represent quantities that have opposite direction using rational numbers. Compare them on a number line and explain the meaning of zero within its context. *Example:* Jasmine is on a cruise and is going on a scuba diving excursion. Her elevations of 10 feet above sea level and 8 feet below sea level can be compared on a number line, where 0 represents sea level.
Benchmark Clarifications	*Clarification 1:* Instruction includes vertical and horizontal number lines, context referring to distances, temperatures and finances and using informal verbal comparisons, such as, lower, warmer or more in debt. *Clarification 2:* Within this benchmark, the expectation is to compare positive and negative rational numbers when given in the same form.
Context	Both
Calculator	Available
Assessment Limits	Items will not require the student to perform operations. Items may use, but are not limited to, contexts involving distance, temperature, or finance.

MA.6.NSO.1	***Extend knowledge of numbers to negative numbers and develop an understanding of absolute value.***
MA.6.NSO.1.3	Given a mathematical or real-world context, interpret the absolute value of a number as the distance from zero on a number line. Find the absolute value of rational numbers.
Benchmark Clarifications	*Clarification 1:* Instruction includes the connection of absolute value to mirror images about zero and to opposites. *Clarification 2:* Instruction includes vertical and horizontal number lines and context referring to distances, temperature and finances.
Context	Both
Calculator	Available
Assessment Limits	Items will not require the student to perform arithmetic operations. Items may use, but are not limited to, contexts involving distance, temperature, or finance.

MA.6.NSO.1	***Extend knowledge of numbers to negative numbers and develop an understanding of absolute value.***
MA.6.NSO.1.4	Solve mathematical and real-world problems involving absolute value, including the comparison of absolute value. *Example:* Michael has a lemonade stand which costs $10 to start up. If he makes $5 the first day, he can determine whether he made a profit so far by comparing $\|-10\|$ and $\|5\|$.
Benchmark Clarifications	*Clarification 1:* Absolute value situations include distances, temperatures and finances. *Clarification 2:* Problems involving calculations with absolute value are limited to two or fewer operations. *Clarification 3:* Within this benchmark, the expectation is to use integers only.
Context	Both
Calculator	Available
Assessment Limits	Items may use, but are not limited to, contexts involving distance, temperature, or finance.

MA.6.NSO.2	***Add, subtract, multiply and divide positive rational numbers.***
MA.6.NSO.2.1	Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.
Benchmark Clarifications	*Clarification 1:* Multi-digit decimals are limited to no more than 5 total digits.
Context	Mathematical
Calculator	Available
Assessment Limits	Decimals that are multiplied or divided by 0.1 or 0.01 must be to at least the hundredths place.

MA.6.NSO.2	***Add, subtract, multiply and divide positive rational numbers.***
MA.6.NSO.2.2	Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on making connections between visual models, the relationship between multiplication and division, reciprocals and algorithms.
Context	Mathematical
Calculator	Available
Assessment Limits	Items requiring the student to multiply a fraction by a fraction must have at least one fraction with a denominator greater than 20. Items will not divide a unit fraction by a whole number or a whole number by a unit fraction.

MA.6.NSO.2	***Add, subtract, multiply and divide positive rational numbers.***
MA.6.NSO.2.3	Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, it is not the expectation to include both decimals and fractions within a single problem.
Context	Real-world
Calculator	Available
Assessment Limits	Context will not include money, perimeter, or area. Items will use at least two different operations but will not use addition and subtraction only. Items with decimals must include one to at least the hundredths. When multiplying fractions, at least one fraction must have a denominator greater than 20. Items will not include a numerical expression.

MA.6.NSO.3	***Apply properties of operations to rewrite numbers in equivalent forms.***
MA.6.NSO.3.1	Given a mathematical or real-world context, find the greatest common factor and least common multiple of two whole numbers. *Example:* Middleton Middle School's band has an upcoming winter concert which will have several performances. The bandleader would like to divide the students into concert groups with the same number of flute players, the same number of clarinet players and the same number of violin players in each group. There are a total of 15 students who play the flute, 27 students who play the clarinet and 12 students who play the violin. How many separate groups can be formed? *Example:* Adam works out every 8 days and Susan works out every 12 days. If both Adam and Susan work out today, how many days until they work out on the same day again?
Benchmark Clarifications	*Clarification 1:* Within this benchmark, expectations include finding greatest common factor within 1,000 and least common multiple with factors to 25. *Clarification 2:* Instruction includes finding the greatest common factor of the numerator and denominator of a fraction to simplify the fraction.
Context	Both
Calculator	Available
Assessment Limits	N/A

MA.6.NSO.3	***Apply properties of operations to rewrite numbers in equivalent forms.***
MA.6.NSO.3.2	Rewrite the sum of two composite whole numbers having a common factor, as a common factor multiplied by the sum of two whole numbers.
Benchmark Clarifications	*Clarification 1:* Instruction includes using the distributive property to generate equivalent expressions.
Context	Both
Calculator	Available
Assessment Limits	The common factor will not exceed 1000.

MA.6.NSO.3	***Apply properties of operations to rewrite numbers in equivalent forms.***
MA.6.NSO.3.3	Evaluate positive rational numbers and integers with natural number exponents.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, expectations include using natural number exponents up to 5.
Context	Mathematical
Calculator	Available
Assessment Limits	Items must include an expression having only a positive rational base and a natural number exponent.

MA.6.NSO.3	***Apply properties of operations to rewrite numbers in equivalent forms.***
MA.6.NSO.3.4	Express composite whole numbers as a product of prime factors with natural number exponents.
Benchmark Clarifications	N/A
Context	Mathematical
Calculator	Available
Assessment Limits	N/A

MA.6.NSO.3	***Apply properties of operations to rewrite numbers in equivalent forms.***
MA.6.NSO.3.5	Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages. *Example:* The number $1\frac{5}{8}$ can be written equivalently as 1.625 or 162.5%.
Benchmark Clarifications	*Clarification 1:* Rational numbers include decimal equivalence up to the thousandths place.
Context	Mathematical
Calculator	Available
Assessment Limits	N/A

MA.6.NSO.4	***Extend understanding of operations with integers.***
MA.6.NSO.4.1	Apply and extend previous understandings of operations with whole numbers to add and subtract integers with procedural fluency.
Benchmark Clarifications	*Clarification 1:* Instruction begins with the use of manipulatives, models and number lines working towards becoming procedurally fluent by the end of grade 6. *Clarification 2:* Instruction focuses on the inverse relationship between the operations of addition and subtraction. If p and q are integers, then $p - q = p + (-q)$ and $p + q = p - (-q)$.
Context	Mathematical
Calculator	Available
Assessment Limits	Items involving addition must incorporate at least one negative integer. Items involving subtraction must incorporate at least one negative integer or can include positive integers wherein the subtrahend is larger than the minuend.

MA.6.NSO.4	***Extend understanding of operations with integers.***
MA.6.NSO.4.2	Apply and extend previous understandings of operations with whole numbers to multiply and divide integers with procedural fluency.
Benchmark Clarifications	*Clarification 1:* Instruction includes the use of models and number lines and the inverse relationship between multiplication and division, working towards becoming procedurally fluent by the end of grade 6. *Clarification 2:* Instruction focuses on the understanding that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers where $q \neq 0$, then $-\left(\frac{p}{q}\right) = \frac{-p}{q}$, $-\left(\frac{p}{q}\right) = \frac{p}{-q}$ and $\frac{p}{q} = \frac{-p}{-q}$.
Context	Mathematical
Calculator	Available
Assessment Limits	Items must incorporate at least one negative integer.

Algebraic Reasoning

MA.6.AR.1	***Apply previous understanding of arithmetic expressions to algebraic expressions.***
MA.6.AR.1.1	Given a mathematical or real-world context, translate written descriptions into algebraic expressions and translate algebraic expressions into written descriptions. *Example:* The algebraic expression $7.2x - 20$ can be used to describe the daily profit of a company who makes \$7.20 per product sold with daily expenses of \$20.
Benchmark Clarifications	
Context	Both
Calculator	Available
Assessment Limits	Algebraic expressions or written descriptions must include at least one but no more than two unknowns. Items will not require the student to perform operations.

MA.6.AR.1	***Apply previous understanding of arithmetic expressions to algebraic expressions.***
MA.6.AR.1.2	Translate a real-world written description into an algebraic inequality in the form of $x > a$, $x < a$, $x \geq a$ or $x \leq a$. Represent the inequality on a number line. *Example:* Mrs. Anna told her class that they will get a pizza if the class has an average of at least 83 out of 100 correct questions on the semester exam. The inequality $g \geq 83$ can be used to represent the situation where students receive a pizza and the inequality $g < 83$ can be used to represent the situation where students do not receive a pizza.
Benchmark Clarifications	*Clarification 1:* Variables may be on the left or right side of the inequality symbol.
Context	Both
Calculator	Available
Assessment Limits	Items may require the student to perform operations. Given context should be continuous.

MA.6.AR.1	***Apply previous understanding of arithmetic expressions to algebraic expressions.***
MA.6.AR.1.3	Evaluate algebraic expressions using substitution and order of operations. *Example:* Evaluate the expression $2a^2 - \frac{b}{5}$, where $a = -1$ and $b = 15$.
Benchmark Clarifications	*Clarification 1:* Within this benchmark, the expectation is to perform all operations with integers. *Clarification 2:* Refer to Properties of Operations, Equality and Inequality (Appendix D).
Context	Mathematical
Calculator	Available
Assessment Limits	Items will not include more than three variables.

MA.6.AR.1	***Apply previous understanding of arithmetic expressions to algebraic expressions.***
MA.6.AR.1.4	Apply the properties of operations to generate equivalent algebraic expressions with integer coefficients. *Example:* The expression $5(3x + 1)$ can be rewritten equivalently as $15x + 5$. *Example:* If the expression $2x + 3x$ represents the profit the cheerleading team can make when selling the same number of cupcakes, sold for $2 each, and brownies, sold for $3 each. The expression $5x$ can express the total profit.
Benchmark Clarifications	*Clarification 1:* Properties include associative, commutative and distributive. *Clarification 2:* Refer to Properties of Operations, Equality and Inequality (Appendix D).
Context	Both
Calculator	Available
Assessment Limits	Items must include an expression with only one or two variables where coefficients, factors, and terms are integers only. Items will require the student to use one, all, or a combination of the associative property, distributive property, commutative property, or arithmetic operations to generate equivalent expressions.

MA.6.AR.2	***Develop an understanding for solving equations and inequalities. Write and solve one-step equations in one variable.***
MA.6.AR.2.1	Given an equation or inequality and a specified set of integer values, determine which values make the equation or inequality true or false. *Example:* Determine which of the following values make the inequality $x + 1 < 2$ true: −4, −2, 0, 1.
Benchmark Clarifications	*Clarification 1:* Problems include the variable in multiple terms or on either side of the equal sign or inequality symbol.
Context	Both
Calculator	Available
Assessment Limits	Coefficients and constants in equations or inequalities must be integer values only. Items will only use one-variable linear equations or inequalities but may include the variable in more than one term. Items may represent equations or inequalities with the variable on either side or both sides of the equal sign or inequality symbol. Items may present sets of integer values using braces. Items will use the relational symbols, >, ≥, <, or ≤, when presenting inequalities.

MA.6.AR.2	***Develop an understanding for solving equations and inequalities. Write and solve one-step equations in one variable.***
MA.6.AR.2.2	Write and solve one-step equations in one variable within a mathematical or real-world context using addition and subtraction, where all terms and solutions are integers. *Example:* The equations −35 + x = 17, 17 = −35 + x and 17 − x = −35 can represent the question "How many units to the right is 17 from -35 on the number line?"
Benchmark Clarifications	*Clarification 1:* Instruction includes using manipulatives, drawings, number lines and inverse operations. *Clarification 2:* Instruction includes equations in the forms $x + p = q$ and $p + x = q$, where x, p and q are any integer. *Clarification 3:* Problems include equations where the variable may be on either side of the equal sign.
Context	Both
Calculator	Available
Assessment Limits	Items will require the student to write an equation, solve an equation, or write and solve an equation. Items must incorporate a negative integer in either the given equation or the solution. Equations will be represented in the form $x + p = q$ or $p + x = q$, where x, p, and q are any integer.

MA.6.AR.2	***Develop an understanding for solving equations and inequalities. Write and solve one-step equations in one variable.***
MA.6.AR.2.3	Write and solve one-step equations in one variable within a mathematical or real-world context using multiplication and division, where all terms and solutions are integers.
Benchmark Clarifications	*Clarification 1:* Instruction includes using manipulatives, drawings, number lines and inverse operations. *Clarification 2:* Instruction includes equations in the forms $\frac{x}{p} = q$, where $p \neq 0$, and $px = q$. *Clarification 3:* Problems include equations where the variable may be on either side of the equal sign.
Context	Both
Calculator	Available
Assessment Limits	Items will require the student to write an equation, solve an equation, or write and solve an equation. Equations will be represented in the form $px = q$ or $\frac{x}{p} = q$, where $p \neq 0$.

MA.6.AR.2	***Develop an understanding for solving equations and inequalities. Write and solve one-step equations in one variable.***
MA.6.AR.2.4	Determine the unknown decimal or fraction in an equation involving any of the four operations, relating three numbers, with the unknown in any position. *Example*: Given the equation $\frac{9}{8} = x - \frac{1}{8}$, x can be determined to be $\frac{10}{8}$ because $\frac{10}{8}$ is $\frac{1}{8}$ more than $\frac{9}{8}$.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on using algebraic reasoning, drawings, and mental math to determine unknowns. *Clarification 2:* Problems include the unknown and different operations on either side of the equal sign. All terms and solutions are limited to positive rational numbers.
Context	Mathematical
Calculator	Available
Assessment Limits	Items will not require the student to relate numbers in different forms.

MA.6.AR.3	***Understand ratio and unit rate concepts and use them to solve problems.***
MA.6.AR.3.1	Given a real-world context, write and interpret ratios to show the relative sizes of two quantities using appropriate notation: $\frac{a}{b}$, a to b, or $a{:}b$ where $b \neq 0$.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on the understanding that a ratio can be described as a comparison of two quantities in either the same or different units. *Clarification 2:* Instruction includes using manipulatives, drawings, models and words to interpret part-to-part ratios and part-to-whole ratios. *Clarification 3:* The values of a and b are limited to whole numbers.
Context	Real-world
Calculator	Available
Assessment Limits	Presentation of context in items does not determine the order of the ratio.

MA.6.AR.3	***Understand ratio and unit rate concepts and use them to solve problems.***
MA.6.AR.3.2	Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate. *Example:* Tamika can read 500 words in 3 minutes. Her reading rate can be described as $\frac{500\ words}{3\ minutes}$ which is equivalent to the unit rate of $166\frac{2}{3}$ words per minute.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on the understanding that a ratio can be described as a comparison of two quantities in either the same or different units. *Clarification 2:* Instruction includes using manipulatives, drawings, models and words to interpret part-to-part ratios and part-to-whole ratios.
Context	Real-world
Calculator	Available
Assessment Limits	Presentation of context in items does not determine the order of the ratio. Items will not require the student to convert units.

<table>
<tr><td>MA.6.AR.3</td><td>Understand ratio and unit rate concepts and use them to solve problems.</td></tr>
<tr><td>MA.6.AR.3.3</td><td>Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.
Example: The table below expresses the relationship between the number of ounces of yellow and blue paints used to create a new color. Determine the ratios and complete the table.
<table>
<tr><td>Yellow (part)</td><td>1.5</td><td>3</td><td></td><td>9</td></tr>
<tr><td>Blue (part)</td><td>2</td><td>4</td><td></td><td></td></tr>
<tr><td>New color (whole)</td><td></td><td></td><td>12</td><td>21</td></tr>
</table></td></tr>
<tr><td>Benchmark Clarifications</td><td>Clarification 1: Instruction includes using two-column tables (e.g., a relationship between two variables) and three-column tables (e.g., part-to-part-to-whole relationship) to generate conversion charts and mixture charts.</td></tr>
<tr><td>Context</td><td>Both</td></tr>
<tr><td>Calculator</td><td>Available</td></tr>
<tr><td>Assessment Limits</td><td>N/A</td></tr>
</table>

<table>
<tr><td>MA.6.AR.3</td><td>Understand ratio and unit rate concepts and use them to solve problems.</td></tr>
<tr><td>MA.6.AR.3.4</td><td>Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.
Example: Gerald is trying to gain muscle and needs to consume more protein every day. If he has a protein shake that contains 32 grams and the entire shake is 340 grams, what percentage of the entire shake is protein? What is the ratio between grams of protein and grams of non-protein?</td></tr>
<tr><td>Benchmark Clarifications</td><td>Clarification 1: Instruction includes the comparison of $\frac{part}{whole}$ to $\frac{percent}{100}$ in order to determine the percent, the part or the whole.</td></tr>
<tr><td>Context</td><td>Both</td></tr>
<tr><td>Calculator</td><td>Available</td></tr>
<tr><td>Assessment Limits</td><td>Items will only require the student to determine the percent, the part, or the whole.
Items will not require the student to convert units.</td></tr>
</table>

MA.6.AR.3	***Understand ratio and unit rate concepts and use them to solve problems.***
MA.6.AR.3.5	Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the measurement system.
Benchmark Clarifications	*Clarification 1:* Instruction includes the use of tables, tape diagrams and number lines.
Context	Both
Calculator	Available
Assessment Limits	Items will not require the student to convert between systems. Items must state the relationship of quantities as a ratio, rate, or unit rate using words or the form $\frac{a}{b}$, *a* to *b*, or *a*:*b* where $b \neq 0$. Items will not require the student to only convert measurements.

Geometric Reasoning

MA.6.GR.1	***Apply previous understanding of the coordinate plane to solve problems.***
MA.6.GR.1.1	Extend previous understanding of the coordinate plane to plot rational number ordered pairs in all four quadrants and on both axes. Identify the x- or y-axis as the line of reflection when two ordered pairs have an opposite x- or y- coordinate.
Benchmark Clarifications	
Context	Mathematical
Calculator	Available
Assessment Limits	Items that require the student to plot points in the first quadrant will not use whole number values for the coordinates. Coordinate planes must be scaled appropriately for given ordered pairs.

MA.6.GR.1	***Apply previous understanding of the coordinate plane to solve problems.***
MA.6.GR.1.3	Solve mathematical and real-world problems by plotting points on a coordinate plane, including finding the perimeter or area of a rectangle.
Benchmark Clarifications	*Clarification 1:* Instruction includes finding distances between points, computing dimensions of a rectangle or determining a fourth vertex of a rectangle. *Clarification 2:* Problems involving rectangles are limited to cases where the sides are parallel to the axes.
Also Assesses	
MA.6.GR.1.2	Find distances between ordered pairs, limited to the same x-coordinate or the same y-coordinate, represented on the coordinate plane.
Benchmark Clarifications	
Context	Both
Calculator	Available
Assessment Limits	Items that require the student to find distance between points must have the same *x*-coordinate or the same *y*-coordinate. Items may use all four quadrants. Ordered pairs must be integers. Items may present the ordered pairs on a coordinate plane.

MA.6.GR.2	***Model and solve problems involving two-dimensional figures and three-dimensional figures.***
MA.6.GR.2.1	Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on the relationship between the area of a rectangle and the area of a right triangle. *Clarification 2:* Within this benchmark, the expectation is to know from memory a formula for the area of a triangle.
Context	Mathematical
Calculator	Available
Assessment Limits	Items must give the vertical height for all triangles.

MA.6.GR.2	***Model and solve problems involving two-dimensional figures and three-dimensional figures.***
MA.6.GR.2.2	Solve mathematical and real-world problems involving the area of quadrilaterals and composite figures by decomposing them into triangles or rectangles.
Benchmark Clarifications	*Clarification 1:* Problem types include finding area of composite shapes and determining missing dimensions. *Clarification 2:* Within this benchmark, the expectation is to know from memory a formula for the area of a rectangle and triangle. *Clarification 3:* Dimensions are limited to positive rational numbers.
Context	Both
Calculator	Available
Assessment Limits	When finding area of composite shapes that decompose into rectangles only, dimensions of the rectangles must overlap, have at least one fraction, or have at least one decimal. Given quadrilaterals will not be rectangles or squares. Items must give the vertical height for all triangles.

MA.6.GR.2	***Model and solve problems involving two-dimensional figures and three-dimensional figures.***
MA.6.GR.2.3	Solve mathematical and real-world problems involving the volume of right rectangular prisms with positive rational number edge lengths using a visual model and a formula.
Benchmark Clarifications	*Clarification 1:* Problem types include finding the volume or a missing dimension of a rectangular prism.
Context	Both
Calculator	Available
Assessment Limits	Items must include at least one fractional or decimal edge length.

MA.6.GR.2	***Model and solve problems involving two-dimensional figures and three-dimensional figures.***
MA.6.GR.2.4	Given a mathematical or real-world context, find the surface area of right rectangular prisms and right rectangular pyramids using the figure's net.
Benchmark Clarifications	*Clarification 1:* Instruction focuses on representing a right rectangular prism and right rectangular pyramid with its net and on the connection between the surface area of a figure and its net. *Clarification 2:* Within this benchmark, the expectation is to find the surface area when given a net or when given a three-dimensional figure. *Clarification 3:* Problems involving right rectangular pyramids are limited to cases where the heights of triangles are given. *Clarification 4:* Dimensions are limited to positive rational numbers.
Context	Both
Calculator	Available
Assessment Limits	Items will not require the student to find surface area using the formula. Items may give a three-dimensional figure and require the student to identify the appropriate net with dimensions and find the surface area.

Data Analysis and Probability

MA.6.DP.1	***Develop an understanding of statistics and determine measures of center and measures of variability. Summarize statistical distributions graphically and numerically.***
MA.6.DP.1.1	Recognize and formulate a statistical question that would generate numerical data. *Example:* The question "How many minutes did you spend on mathematics homework last night?" can be used to generate numerical data in one variable.
Benchmark Clarifications	
Context	Real-world
Calculator	Available
Assessment Limits	N/A

MA.6.DP.1	***Develop an understanding of statistics and determine measures of center and measures of variability. Summarize statistical distributions graphically and numerically.***
MA.6.DP.1.2	Given a numerical data set within a real-world context, find and interpret mean, median, mode and range. *Example:* The data set {15, 0, 32, 24, 0, 17, 42, 0, 29, 120, 0, 20}, collected based on minutes spent on homework, has a mode of 0.
Benchmark Clarifications	*Clarification 1:* Numerical data is limited to positive rational numbers.
Context	Real-world
Calculator	Available
Assessment Limits	Data sets are limited to no more than 20 data points. Items will not require the student to calculate mean with data sets containing more than 10 data points. Items must present numerical data as a set using braces, graphically, or in a table.

MA.6.DP.1	***Develop an understanding of statistics and determine measures of center and measures of variability. Summarize statistical distributions graphically and numerically.***
MA.6.DP.1.3	Given a box plot within a real-world context, determine the minimum, the lower quartile, the median, the upper quartile and the maximum. Use this summary of the data to describe the spread and distribution of the data. *Example:* The middle 50% of the population can be determined by finding the interval between the upper quartile and the lower quartile.
Benchmark Clarifications	*Clarification 1:* Instruction includes describing range, interquartile range, halves and quarters of the data.
Context	Real-world
Calculator	Available
Assessment Limits	Items may require the student to describe box plots using the words symmetry, skewed, minimum, maximum, median, lower or upper quartile, outlier(s), range, interquartile range, halves, or quarters. Items may use vertical or horizontal number lines.

MA.6.DP.1	***Develop an understanding of statistics and determine measures of center and measures of variability. Summarize statistical distributions graphically and numerically.***
MA.6.DP.1.4	Given a histogram or line plot within a real-world context, qualitatively describe and interpret the spread and distribution of the data, including any symmetry, skewness, gaps, clusters, outliers and the range.
Benchmark Clarifications	*Clarification 1:* Refer to K-12 Mathematics Glossary (Appendix C).
Context	Real-world
Calculator	Available
Assessment Limits	Items will not require the student to calculate statistical measures or describe a plot using a statistical value, except range. Items may require the student to describe the representation using the words symmetry, skewed, gap(s), cluster(s), outliers, or range.

MA.6.DP.1	***Develop an understanding of statistics and determine measures of center and measures of variability. Summarize statistical distributions graphically and numerically.***
MA.6.DP.1.5	Create box plots and histograms to represent sets of numerical data within real-world contexts. *Example:* The numerical data set {15, 0, 32, 24, 0, 17, 42, 0, 29, 120, 0, 20}, collected based on minutes spent on homework, can be represented graphically using a box plot.
Benchmark Clarifications	*Clarification 1:* Instruction includes collecting data and discussing ways to collect truthful data to construct graphical representations. *Clarification 2:* Within this benchmark, it is the expectation to use appropriate titles, labels, scales and units when constructing graphical representations. *Clarification 3:* Numerical data is limited to positive rational numbers.
Context	Real-world
Calculator	Available
Assessment Limits	Items will not require the student to calculate statistical measures outside of those needed to create a box plot, when necessary. Data sets are limited to no more than 20 data points.

MA.6.DP.1	***Develop an understanding of statistics and determine measures of center and measures of variability. Summarize statistical distributions graphically and numerically.***
MA.6.DP.1.6	Given a real-world scenario, determine and describe how changes in data values impact measures of center and variation.
Benchmark Clarifications	*Clarification 1:* Instruction includes choosing the measure of center or measure of variation depending on the scenario. *Clarification 2:* The measures of center are limited to mean and median. The measures of variation are limited to range and interquartile range. *Clarification 3:* Numerical data is limited to positive rational numbers.
Context	Real-world
Calculator	Available
Assessment Limits	Items that require choosing a measure of center or measure of variation must be based on the effect of changes made to the data set.

Appendix A

Grade 6 FAST Mathematics Reference Sheet

Customary Conversions

1 foot = 12 inches
1 yard = 3 feet
1 mile = 5,280 feet
1 mile = 1,760 yards

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts

1 pound = 16 ounces
1 ton = 2,000 pounds

Metric Conversions

1 meter = 100 centimeters
1 meter = 1000 millimeters
1 kilometer = 1000 meters

1 liter = 1000 milliliters

1 gram = 1000 milligrams
1 kilogram = 1000 grams

Time Conversions

1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 week = 7 days
1 year = 365 days
1 year = 52 weeks

Formulas

Rectangular Prism

$V = lwh$

or

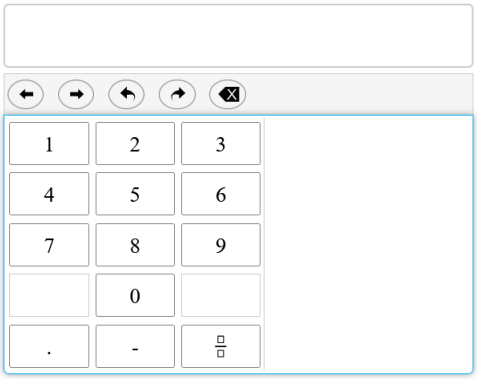
$V = Bh$

Key	
l = length w = width h = height	B = area of base V = volume

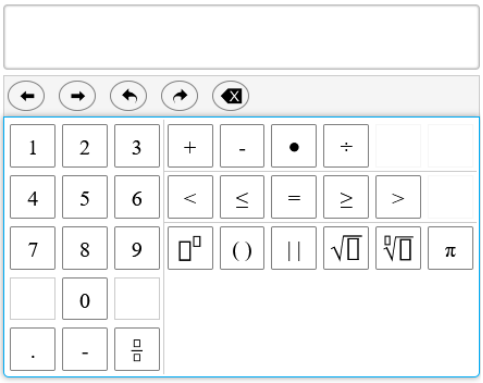
Appendix B

Keypads for Grade 6 Computer-Based Tests

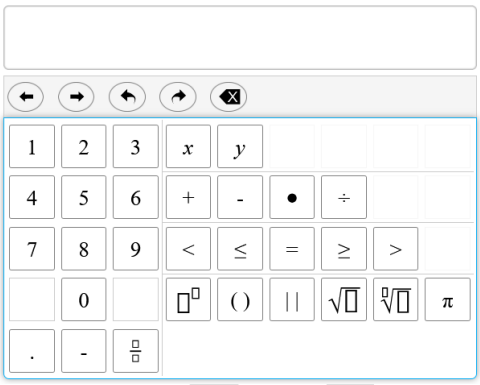
Numeric Only

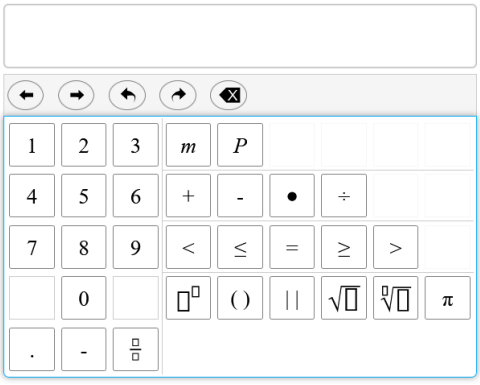


Full Keypad



Full Keypad with Variables:
Variables may change but the rest of the keys are always the same as the full keypad above.





Appendix C: Change Log

Page(s)	Change	Date
5	Updated calculator information	November 2022
6	Updated Calculator Designations	November 2022
7	Updated Calculator Designations	November 2022
8	Updated Calculator Designation for MA.6.NSO.2.2	November 2022
11	Updated Calculator Designations	November 2022
12	Updated Calculator Designation for MA.6.AR.1.1	November 2022
22	Updated Calculator Designation for MA.6.DP.1.1	November 2022
1	Added “AND REVIEWERS” after “ITEM WRITERS”	June 2023
3	Removed “of” after “select all” in the multi-select section.	June 2023
28	Added “the” after “same as” in Full Keypad With Variables section. Added period to end of statement.	June 2023
3-4	Updated language to remove “scanned and scored electronically.”	August 2023